in: Frauke Kraas, Hartmut Gaese, Mi Mi Kyi (eds.) (2006): Megacity Yangon: Transformation processes and modern developments. Southeast Asian Modernities 7. Berlin: 261-283.

Woodfuel Uses: A Distinct Phenomenon in Megacity Yangon, Myanmar

Zin Nwe Myint

Introduction

Before entering to 21st century, the idea of sustainable development had emerged through the increasing awareness of deteriorating environment. Tremendous efforts had been made to cure it by various actors in various sectors. Especially after the United Nations Conference on Human Environment known as First Earth Summit, held in 1972 at Stockholm, more attention to the concept of sustainable development was made. Later, it was realized that urban areas are suitable to put as focal points for considering sustainable development. The best highlighting fact of this is the growing urbanization with faster rates, especially in developing countries.

An important fact pointed out by Satterthwaite is that much of the sustainable development works almost exclusively concerned with the ecological point of view and little or no attention is put on development in the sense of meeting human need. In his approach to sustainable development, Satterthwaite made an important suggestion that the 'sustainable' part of sustainable development should be considered as avoiding the depletion of environmental capital while the 'development' part should be considered as the meeting of human needs (1997: 1680).

In developing countries, the demand of woodfuel by urban areas is often considered to be responsible for serious environmental degradation (FAO 1993: 91). In Myanmar, according to a report of the Central Statistical Organization (CSO), 60.73% of the total households of Yangon City used woodfuel in 1997. It seems that the same trend can be found until now.

In this situation, how can it be considered sustainable urban development of Yangon if the City is heavily relying on woodfuel? Because, on the one hand, woodfuel is extracted from the forests, destroying the environment and economically valuable resources, on the other hand, it is to fulfil the daily fuel need of the people in Yangon City.

This study aims at understanding the woodfuel utilization system in Yangon City, to assess the amount of woodfuel use according to sectors, to investigate the nature and extent of woodfuel marketing in Yangon City, to assess the impact of woodfuel uses, and to evaluate the woodfuel use of Yangon within the context of sustainable urban development.

Understanding the woodfuel system of Yangon can help towards the development of better energy planning and regulations that would allow to fulfil the energy need of Yangon in the most appropriate way and to lessen the undesirable impacts on supply sources. After all, it can effectively contribute to the sustainable urban development of Yangon City, by reducing the negative impact of woodfuel use both at the supply sources and in Yangon City and meeting the people's energy need.

In Yangon City the main woodfuel users can be grouped into two types, households and commercial businesses. Thus, the demand for woodfuel was studied through two surveys, focusing on household fuel uses and commercial business fuel uses. The main objectives of household and commercial business surveys are to know the fuel use pattern of households for cooking, to quantify the amount of woodfuel used by both household and commercial business sectors, to understand the nature of fuel choices, to understand the main reasons for choosing certain fuels, and to understand the perceptions of both households and businesses. Questionnaires for both types of surveys were distributed to all 33 townships of Yangon City. Besides, to understand the market situation of woodfuel in Yangon City, urban woodfuel trader surveys were made to acquire a broad understanding of how urban woodfuel trade is operating and to have some quantitative estimates of volume according to supply sources. Methodology used in this study was mainly qualitative, especially interviews were used.

Factors influencing the woodfuel uses in Yangon City

In Yangon City woodfuel is a major fuel for household cooking and no other mode of energy type can replace it until now. Thus, it becomes necessary to know why woodfuel is dominating as a main fuel in Yangon City.

Population Growth

As the population figures directly influence woodfuel use, the demographic situation of Yangon in the form of total population growth and household distributions is analyzed for a better understanding of woodfuel demand by Yangon City. The population of Yangon usually increases through many reasons: by natural increase, by migration and by boundary expansion. According to the 1983 census, Yangon had a population of 2,513,023. Since there were no censuses after 1983,

the estimated population data have been quite controversial. Data discrepancy always occurs between different institutional sources. The population of Yangon estimated by the Population Department was 4.11 million in 2003. An authority of YCDC said that it was nearly up to six million. Another source said that there were 5.47 million people in Yangon City in 1998 (Mi Mi Kyi et al. 2002: 542). By quoting a report to the State Peace and Development Committee, one scholar agreed with 5.47 million people in Yangon in 1999 (Yin May 2003). According to the surveys of Myanmar Marketing Research and Development Company, the population of Yangon in late 2002 was about 5.8 million.

Based on the data of the Population Department, figure 1 shows a clear picture on population growth of Yangon City in terms of households according to groups of townships.

According to figure 1, within thirty years, the number of households has more than doubled. If the Yangon City population is assumed at 5.8 million in 2003, the total number of households would be about 1.12 million. Such increase in households through population growth directly affects the energy demand. This has a pronounced effect on woodfuel use of Yangon through household cooking. Another significant change in figure 1 is the occurrence of new townships.

Group of Townships	Household Distribution			
	1973	1983	1993	2003
Main Business Area	36177	36055	41569	47588
Southern Townships	11270	13686	16617	22191
Inner Urban Townships	110260	118561	129374	151318
Outer Urban Townships	79298	97989	106681	129157
Older Townships	90545	112207	127457	170303
Northern Townships	62094	95499	101203	128346
New Townships	nil	nil	77828	148291
Total Yangon City	389644	473997	600729	797195

Fig. 1: Household distribution of Yangon from 1973 to 2003 (Source: Zin Nwe Myint 2004: 69)

Urban Expansion

One of the major determining factors of woodfuel demand is the expansion of the city. Figure 2 and 3 show the areal growth of Yangon.

At the end of the third Anglo-Myanmar War in 1885, the whole of Myanmar was under British Rule and Yangon became the capital city of colonial Myanmar. After Myanmar regained independence, Yangon continued to serve as the capital city. In 1959, under the Caretaker Government, three new satellite towns, South Ok-

Years	Area (Square Kilometres)
1901	72.52
1953	123.2
1965	165.57
1973	208.62
1983	346.12
1991	678.78

Fig. 2: Areal expansion of Yangon City (Source: Zin Nwe Myint 1998: 43)

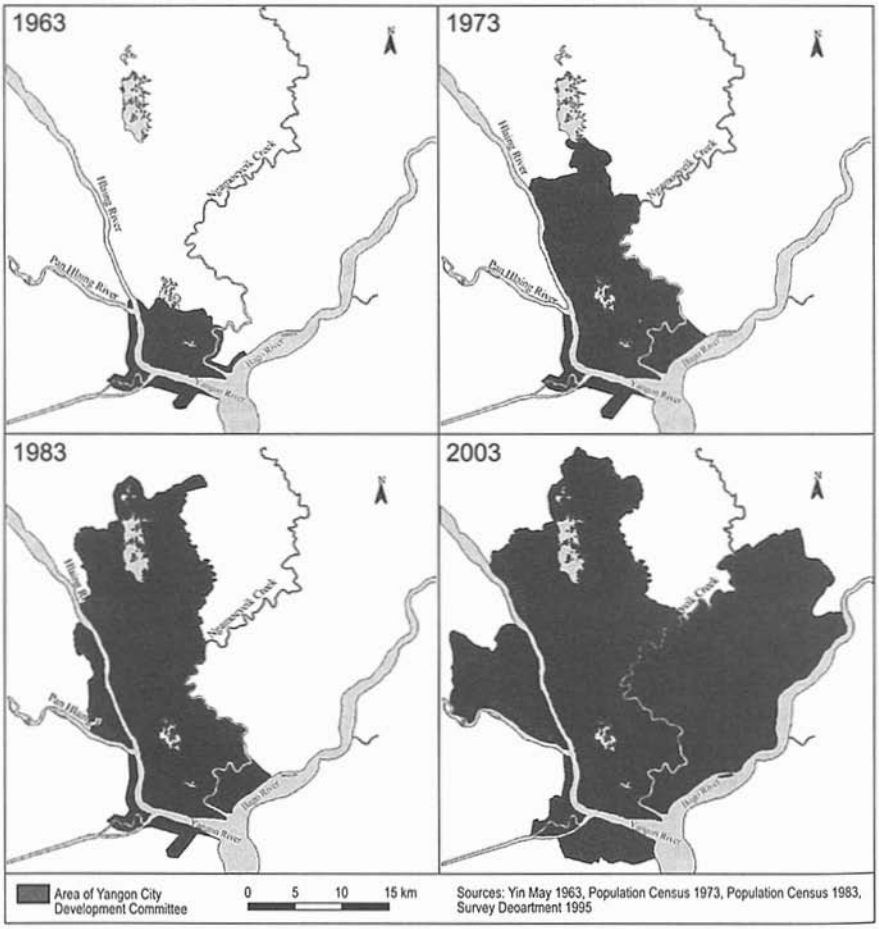

Fig. 3: Areal expansion of Yangon City

kalapa, North Okkalapa and Tharkayta were built. The Revolutionary Council had assumed power in 1962 and the city's area was extended to comprise 165.57 square kilometres. In 1974, the People's Council re-established the city area

again with 208.62 square kilometres. According to the 1983 census, Yangon City had 346.12 square kilometres. Soon after the political changes in 1988, Yangon City had largely outgrown this area due to the establishment of new towns, which are now new townships of Yangon.

The large New Towns are Dagon, Hlaingtharyar and Shwepyithar. Apart from these large New Towns, there are also many small New Towns such as Weibergi, Shwepaukkan, Pale and Padamyar. In 1995, the city area became 678.78 square kilometres, whereas the proposed area for Yangon City at that time was 793 square kilometres. This is the most influencing factor on woodfuel demand, as electricity and other alternative fuels cannot supply these areas sufficiently.

Another effect is the establishment of many industrial zones in new townships, which usually need large amounts of energy supply. Such large-scale industrial zones had never been established in Yangon City prior to 1988. The construction of industrial zones with the aim to help to develop these new towns is favourable. However, in the situation of insufficient electricity supply, these industrial zones use a considerable share of the total electricity supply of Yangon.

The electricity supply prior to the establishment of new towns was already insufficient. With insufficient supply of electricity, the normal supply was allocated to these industrial zones which consequently reduced the amount of electricity distributed to households. Thus, the establishment of New Towns is closely related to the use of woodfuel in Yangon, through increased insufficiency of electricity supply.

Insufficiency of energy supply

Although the population growth and urban expansion take place, if electricity and gas (LPG) can supply sufficiently, Yangon need not rely on woodfuel to such an extent. The main influencing factor on woodfuel demand of Yangon City is the insufficient supply of electricity and alternative energy.

According to data from Myanma Electric Power Enterprises (MEPE), the monthly electricity supply to all 33 townships of Yangon City was generally increased. Although the electricity supply had increased the gap between demand and supply is still great. Based on data from MEPE, figure 4 has been prepared to show the present electricity supply situation for domestic purposes to all townships of Yangon City for 1992, 1997 and 2002. In preparing this map, the monthly total electricity consumption of a household is assumed at a minimum of 185 kWh. It is calculated based on sample power consumption of essential electrical appliances for a household of Yangon City. This calculation is interpreted with a map which shows that many townships, especially new townships, did not have this minimum requirement of electricity in 1992, through 1997 and until 2002.

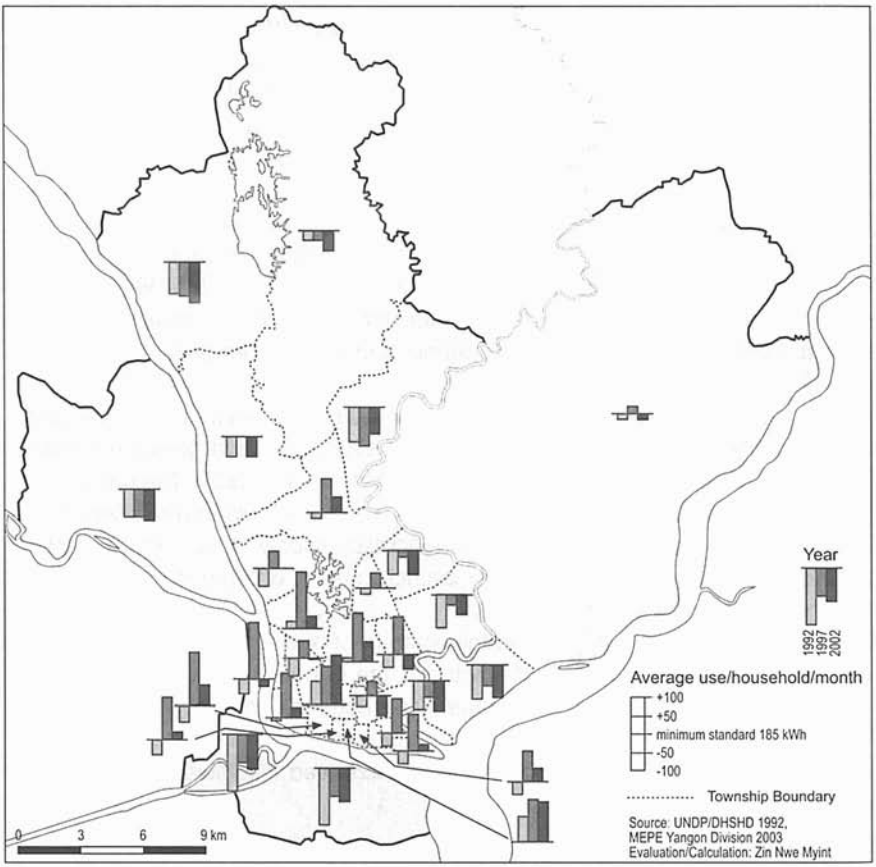

Fig. 4: Domestic electricity consumption in townships of Yangon City for 1992, 1997, 2002

Another suitable fuel type for cooking in Yangon City is gas (Liquefied Petroleum Gas/LPG) which is mainly controlled by the State. Although the amount of LPG use is increasing, the total number of LPG gas stoves permitted by Myanma Petrochemical Enterprise (MPE) was far lower than the demand. From December 1988 to January 2003, the permitted amount of LPG cylinders for household cooking was a total of 26,622 for the whole country (MPE: 2003). Even if all these were assumed to be distributed for Yangon City, this can only support about 1/45 of the total households of the City, if the Yangon City population is assumed as 5.8 million in 2003.

In Yangon City, the increase of population and urban expansion are influencing factors of woodfuel use. Above all, it is the insufficient energy supply, especially electricity. It is severely insufficient due to many difficulties, such as technology, investments, especially of foreign investments, etc. which all are acting upon the

State's policy and performance of the related institutions. Apart from electricity, natural gas is not widely used for cooking as the supply is very limited although a large potential exists and is produced in Myanmar. Thus, in such a situation the basic need of energy in Yangon City is met by woodfuel, especially charcoal.

Woodfuel Demand of Yangon City

Woodfuel use in the household sector

From the household fuel use survey, it was discovered that the average amount of charcoal used for cooking per household is 0.82 kg per day (0.5 viss in Myanmar traditional measure), regardless of household size and income situation (own survey 2003). The annual consumption of charcoal per household is 293.93 kg or 0.3 metric tons per year. According to calculations based on the total population of 5.8 million in 2003 and 60% of the total households using charcoal for cooking, the estimated amount of annual charcoal demand by residential sectors of Yangon will be about 202,325 metric tons per year.

According to figure 5, charcoal is used in all household expenditure categories. The highest use is found especially in the lowest expenditure group with 65% of the total households having an expenditure of under Kyats 30,000 (1 US$ was about 900 Kyats in 2003). In these per month household expenditure groups, the percentage use of charcoal is markedly reduced while the use of electricity

Fuel Type	Household Expenditure Categories (Kyats/Month)											
	0-30000		30001-60000		60001-90000		90001-120000		120001-150000		Above 150000	
	n	%	n	%	n	%	n	%	n	%	n	%
Charcoal	41	65	90	58	31	62	15	41	3	38	5	29
Firewood	2	3	4	3	0	0	0	0	0	0	0	0
Electricity	20	32	54	35	12	24	15	41	1	13	6	35
LPG	0	0	7	5	7	14	7	19	4	50	6	35
Total	**63**	**100**	**155**	**100**	**50**	**100**	**37**	**100**	**8**	**100**	**17**	**100**

Fig. 5: Primary cooking fuel according to household expenditure category of Yangon City in 2003 (Source: Own Household Fuel Use Survey, 2003, Note: n = number of sample households)

and LPG has increased. The highest LPG use, 50% of the total households, was found in the monthly expenditure category of between Kyats 120,000 and 150,000. Thus, it may be concluded that the ability to spend a high household expenditure exerts a strong influence on the main fuel type for cooking in Yangon City.